

WHAT IS CLAIMED IS:

- 1 ~~Sub A2~~ 1. A method for maintaining workflow related information, comprising:  
2 providing at least one table in a database storing workflow related data; ~~15, 20-22~~  
3 providing a plurality of programming interfaces, wherein each programming  
4 interface specifies an operation to perform on the workflow related data in the at least one  
5 table, wherein each programming interface is associated with one stored procedure call; ~~15, 18-25~~  
6 providing in the database one stored procedure for each stored procedure call and  
7 corresponding method, wherein the stored procedure includes a plurality of database  
8 statements to perform the programming interface operation; and ~~15, 28-30~~  
9 executing one stored procedure in the database to perform the corresponding  
10 programming interface operation on workflow related data in one table. ~~11, 21-26~~
- 1 2. The method of claim 1, wherein one provided table comprises a workflow  
2 file table including entries of workflow files, wherein each workflow file includes code  
3 defining an entire workflow, including nodes and workflow parameters.
- 1 3. The method of claim 2, further comprising:  
2 providing one table including information on actions associated with one  
3 workflow file in the workflow file table, wherein the associated actions are capable of  
4 being performed at the nodes defined in the associated workflow file.
- 1 4. The method of claim 1, wherein there are a plurality of tables including  
2 workflow related data, and wherein providing the plurality of programming interfaces and  
3 associated stored procedure calls and stored procedures further comprises:  
4 providing a set of programming interfaces for each table including workflow  
5 related data, wherein each set of programming interfaces defines a same set of operations  
6 to perform on the table for which the set is provided; and

7 providing stored procedure calls and stored procedures in the database for each set  
8 of programming interfaces to implement the programming interface operations in the set.

1 5. The method of claim 4, wherein the programming interfaces for each table  
2 are members of a table class, wherein there is one table class for each table including  
3 workflow related data.

1 6. The method of claim 4, wherein the workflow related tables comprise:  
2 a workflow file table, wherein each entry includes one workflow file including  
3 code defining a workflow and nodes of the workflow;  
4 a worklist table, wherein each entry includes a worklist associated with a plurality  
5 of work items performed at the nodes defined in the associated workflow files; and  
6 an action list table, wherein each entry includes a list of actions capable of being  
7 performed at the nodes defined within one workflow file in the workflow file table.

1 7. The method of claim 6, wherein the workflow related tables further  
2 comprise:  
3 an action table, wherein each entry includes one action name and an address of a  
4 program implementing the action, wherein every action listed in the entries of the action  
5 list table are defined in the action table.

1 8. The method of claim 4, wherein each set of programming interfaces  
2 includes:  
3 a create programming interface to invoke one stored procedure to create an entry  
4 of workflow related data in the table associated with the set;  
5 a get programming interface to invoke one stored procedure to retrieve one entry  
6 of workflow related data from the table associated with the set;

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7 an update programming interface to invoke one stored procedure to update one  
8 entry of workflow related data in the table associated with the set;  
9 a delete programming interface to invoke one stored procedure to delete one entry  
10 of workflow related data in the table associated with the set; and  
11 a list programming interface to invoke one stored procedure to list a description of  
12 all entries of workflow related data in the table associated with the set.

1 9. The method of claim 1, further comprising:  
2 receiving workflow related data from a workflow builder program, wherein the  
3 workflow builder program calls the programming interfaces to invoke the associated  
4 stored procedure calls and the stored procedures to perform the programming interface  
5 operations on the at least one table of workflow related data.

1 10. The method of claim 9, wherein one table comprises a workflow file table,  
2 wherein each entry of the workflow file table includes a workflow file including code  
3 defining an entire workflow, including nodes and workflow parameters, wherein the  
4 workflow files in the workflow file tables are generated by the builder program.

1 11. The method of claim 10; further comprising:  
2 executing one stored procedure to retrieve one workflow file in response to  
3 receiving a stored procedure call invoked by a programming interface from the buildtime  
4 program to retrieve one workflow file, wherein the build time program exports the  
5 retrieved workflow file to a workflow engine.

1 12. The method of claim 10, wherein the workflow files are implemented in  
2 the FlowMark Definition Language (FDL).

- 1 13. A method for maintaining information in a database, comprising:  
2 (a) receiving column definitions for multiple columns in at least one table; and  
3 (b) for each table for which column definitions are received, performing:  
4 (i) generating a table in the database including one column for each  
5 column definition, wherein each column is generated with attributes specified by  
6 the column definition for which the column is generated; and  
7 (ii) generating at least one stored procedure including database statements  
8 in the database to perform an operation on the data in the generated table, wherein  
9 the stored procedure is capable of accessing the columns generated according to  
10 the column definitions.
- 1 14. The method of claim 13, wherein each provided programming interface  
2 comprises an object oriented programming interface.
- 1 15. The method of claim 14, wherein the provided programming interfaces are  
2 members of an object oriented class, wherein one class is provided for each generated  
3 table, and wherein the programming interfaces for one class are capable of invoking  
4 stored procedures to perform database operations on the table for which the class of  
5 programming interfaces are provided
- 1 16. The method of claim 13, further comprising:  
2 providing one programming interface for each generated stored procedure,  
3 wherein each provided programming interface is called to invoke one stored procedure  
4 call to further invoke and execute one stored procedure in the database.
- 1 17. The method of claim 16, wherein a set of programming interfaces is  
2 provided for each table, wherein each set of programming interfaces includes:

3           a create programming interface to invoke one stored procedure to create an entry  
4 in the table associated with the set;  
5           a get programming interface to invoke one stored procedure to retrieve data from  
6 the table associated with the set;  
7           an update programming interface to invoke one stored procedure to update one  
8 entry in the table associated with the set;  
9           a delete programming interface to invoke one stored procedure to delete one entry  
10 in the table associated with the set; and  
11           a list programming interface to invoke one stored procedure to list a description of  
12 all entries in the table associated with the set.

1           18.    The method of claim 13, wherein the information maintained in the at least  
2 one database table comprises workflow related information.

1           19.    The method of claim 13, wherein each column definition indicates a data  
2 type and data length of the column.

1           20.    A system for maintaining workflow related information, comprising:  
2           a storage device;  
3           a database in the storage device including at least one table storing workflow  
4 related data;  
5           a computer readable medium including a plurality of programming interfaces,  
6 wherein each programming interface specifies an operation to perform on the workflow  
7 related data in the at least one table, wherein each programming interface is associated  
8 with one stored procedure call in the computer readable medium;  
9           means for providing one stored procedure in the database for each stored  
10 procedure call and corresponding programming interface, wherein the stored procedure

11 includes a plurality of database statements to perform the programming interface  
12 operation; and  
13 means for executing one stored procedure in the database to perform the  
14 corresponding programming interface operation on workflow related data in one table.

1 21. The system of claim 20, wherein one provided table comprises a workflow  
2 file table including entries of workflow files, wherein each workflow file includes code  
3 defining an entire workflow, including nodes and workflow parameters.

1 22. The system of claim 22, further comprising:  
2 one table in the database including information on actions associated with one  
3 workflow file in the workflow file table, wherein the associated actions are capable of  
4 being performed at the nodes defined in the associated workflow file.

1 23. The system of claim 20, wherein there are a plurality of tables including  
2 workflow related data in the database, and wherein the means for providing the plurality  
3 of programming interfaces and associated stored procedure calls and stored procedures  
4 further perform  
5 providing a set of programming interfaces for each table including workflow  
6 related data, wherein each set of programming interfaces defines a same set of operations  
7 to perform on the table for which the set is provided; and  
8 providing stored procedure calls and stored procedures in the database for each set  
9 of programming interfaces to implement the programming interface operations in the set.

1 24. The system of claim 23, wherein the programming interfaces for each  
2 table are members of a table class, wherein there is one table class for each table  
3 including workflow related data.

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1           25.    The system of claim 23, wherein the workflow related tables in the  
2 database comprise:  
3           a workflow file table, wherein each entry includes one workflow file including  
4 code defining a workflow and nodes of the workflow;  
5           a worklist table, wherein each entry includes a worklist associated with a plurality  
6 of work items performed at the nodes defined in the associated workflow files; and  
7           an action list table, wherein each entry includes a list of actions capable of being  
8 performed at the nodes defined within one workflow file in the workflow file table.

1           26.    The system of claim 25, wherein the workflow related tables in the  
2 database further comprise:  
3           an action table, wherein each entry includes one action name and an address of a  
4 program implementing the action, wherein every action listed in the entries of the action  
5 list table are defined in the action table.

1           27.    The system of claim 23, wherein each set of programming interfaces in the  
2 computer readable medium includes:  
3           a create programming interface to invoke one stored procedure to create an entry  
4 of workflow related data in the table associated with the set;  
5           a get programming interface to invoke one stored procedure to retrieve one entry  
6 of workflow related data from the table associated with the set;  
7           an update programming interface to invoke one stored procedure to update one  
8 entry of workflow related data in the table associated with the set;  
9           a delete programming interface to invoke one stored procedure to delete one entry  
10 of workflow related data in the table associated with the set; and  
11           a list programming interface to invoke one stored procedure to list a description of  
12 all entries of workflow related data in the table associated with the set.

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1           28.    The system of claim 20, further comprising:  
2                means for receiving workflow related data from a workflow builder program,  
3 wherein the workflow builder program calls the programming interfaces to invoke the  
4 associated stored procedure calls and the stored procedures to perform the programming  
5 interface operations on the at least one table of workflow related data.

1           29.    The system of claim 28, wherein one table in the database comprises a  
2 workflow file table, wherein each entry of the workflow file table includes a workflow  
3 file including code defining an entire workflow, including nodes and workflow  
4 parameters, wherein the workflow files in the workflow file tables are generated by the  
5 builder program.

1           30.    The system of claim 29, further comprising:  
2                means for executing one stored procedure to retrieve one workflow file in  
3 response to receiving a stored procedure call invoked by a programming interface from  
4 the buildtime program to retrieve one workflow file, wherein the build time program  
5 exports the retrieved workflow file to a workflow engine.

1           31.    The system of claim 29, wherein the workflow files are implemented in  
2 the FlowMark Definition Language (FDL).

1           32.    A system for maintaining information in a database, comprising:  
2                (a) means for receiving column definitions for multiple columns in at least one  
3 table;  
4                (b) means for generating a table in the database including one column for each  
5 received column definition, wherein each column is generated with attributes specified by  
6 the column definition for which the column is generated; and



7 (c) means for generating at least one stored procedure including database  
8 statements in the database to perform an operation on the data in the generated table,  
9 wherein the stored procedure is capable of accessing the columns generated according to  
10 the column definitions.

1 33. The system of claim 32, wherein each programming interface comprises  
2 an object oriented programming interface.

1 34. The system of claim 33, wherein the programming interfaces are members  
2 of an object oriented class, wherein one class is provided for each generated table, and  
3 wherein the programming interfaces for one class are capable of invoking stored  
4 procedures to perform database operations on the table for which the class of  
5 programming interfaces are provided.

1 35. The system of claim 32, further comprising:  
2 a computer readable medium including one programming interface for each  
3 generated stored procedure, wherein each programming interface is called to invoke one  
4 stored procedure call to further invoke and execute one stored procedure in the database.

1 36. The system of claim 35, wherein the computer readable medium includes a  
2 set of programming interfaces for each table, wherein each set of programming interfaces  
3 in the computer readable medium includes:

4 a create programming interface to invoke one stored procedure to create an entry  
5 in the table associated with the set;

6 a get programming interface to invoke one stored procedure to retrieve data from  
7 the table associated with the set;

8 an update programming interface to invoke one stored procedure to update one  
9 entry in the table associated with the set;

10           a delete programming interface to invoke one stored procedure to delete one entry  
11   in the table associated with the set; and  
12           a list programming interface to invoke one stored procedure to list a description of  
13   all entries in the table associated with the set.

1           37.    The system of claim 32, wherein the information maintained in the at least  
2   one database table comprises workflow related information.

1           38.    The system of claim 32, wherein each column definition indicates a data  
2   type and data length of the column.

1           39.    An article of manufacture including code for maintaining workflow related  
2   information by:  
3           providing at least one table in a database storing workflow related data;  
4           providing a plurality of programming interfaces, wherein each programming  
5   interface specifies an operation to perform on the workflow related data in the at least one  
6   table, wherein each programming interface is associated with one stored procedure call;  
7           providing in the database one stored procedure for each stored procedure call and  
8   corresponding programming interface, wherein the stored procedure includes a plurality  
9   of database statements to perform the programming interface operation; and  
10          executing one stored procedure in the database to perform the corresponding  
11   programming interface operation on workflow related data in one table.

1           40.    The article of manufacture of claim 39, wherein one provided table  
2   comprises a workflow file table including entries of workflow files, wherein each  
3   workflow file includes code defining an entire workflow, including nodes and workflow  
4   parameters.

1           41.    The article of manufacture of claim 40, further comprising one table  
2 including information on actions associated with one workflow file in the workflow file  
3 table, wherein the associated actions are capable of being performed at the nodes defined  
4 in the associated workflow file.

1           42.    The article of manufacture of claim 39, wherein there are a plurality of  
2 tables including workflow related data, and wherein providing the plurality of  
3 programming interfaces and associated stored procedure calls and stored procedures  
4 further comprises:  
5           providing a set of programming interfaces for each table including workflow  
6 related data, wherein each set of programming interfaces defines a same set of operations  
7 to perform on the table for which the set is provided; and  
8           providing stored procedure calls and stored procedures in the database for each set  
9 of programming interfaces to implement the programming interface operations in the set.

1           43.    The article of manufacture of claim 42, wherein the programming  
2 interfaces for each table are members of a table class, wherein there is one table class for  
3 each table including workflow related data.

1           44.    The article of manufacture of claim 42, wherein the workflow related  
2 tables comprise:  
3           a workflow file table, wherein each entry includes one workflow file including  
4 code defining a workflow and nodes of the workflow;  
5           a worklist table, wherein each entry includes a worklist associated with a plurality  
6 of work items performed at the nodes defined in the associated workflow files; and  
7           an action list table, wherein each entry includes a list of actions capable of being  
8 performed at the nodes defined within one workflow file in the workflow file table.

1           45.    The article of manufacture of claim 44, wherein the workflow related  
2 tables further comprise:

3                an action table, wherein each entry includes one action name and an address of a  
4 program implementing the action, wherein every action listed in the entries of the action  
5 list table are defined in the action table.

1           46.    The article of manufacture of claim 42, wherein each set of programming  
2 interfaces includes:

3                a create programming interface to invoke one stored procedure to create an entry  
4 of workflow related data in the table associated with the set;

5                a get programming interface to invoke one stored procedure to retrieve one entry  
6 of workflow related data from the table associated with the set;

7                an update programming interface to invoke one stored procedure to update one  
8 entry of workflow related data in the table associated with the set;

9                a delete programming interface to invoke one stored procedure to delete one entry  
10 of workflow related data in the table associated with the set; and

11               a list programming interface to invoke one stored procedure to list a description of  
12 all entries of workflow related data in the table associated with the set.

1           47.    The article of manufacture of claim 39, further comprising:

2                receiving workflow related data from a workflow builder program, wherein the  
3 workflow builder program calls the programming interfaces to invoke the associated  
4 stored procedure calls and the stored procedures to perform the programming interface  
5 operations on the at least one table of workflow related data.

1           48.    The article of manufacture of claim 47, wherein one table comprises a  
2 workflow file table, wherein each entry of the workflow file table includes a workflow  
3 file including code defining an entire workflow, including nodes and workflow

4 parameters, wherein the workflow files in the workflow file tables are generated by the  
5 builder program.

1 49. The article of manufacture of claim 48, further comprising:  
2 executing one stored procedure to retrieve one workflow file in response to  
3 receiving a stored procedure call invoked by a programming interface from the buildtime  
4 program to retrieve one workflow file, wherein the build time program exports the  
5 retrieved workflow file to a workflow engine.

1 50. The article of manufacture of claim 48, wherein the workflow files are  
2 implemented in the FlowMark Definition Language (FDL).

1 51. An article of manufacture including code for maintaining information in a  
2 database by:

- 3 (a) receiving column definitions for multiple columns in at least one table;  
4 (b) for each table for which column definitions are received, performing:  
5 (i) generating a table in the database including one column for each  
6 column definition, wherein each column is generated with attributes specified by  
7 the column definition for which the column is generated; and  
8 (ii) generating at least one stored procedure including database statements  
9 in the database to perform an operation on the data in the generated table, wherein  
10 the stored procedure is capable of accessing the columns generated according to  
11 the column definitions.

1 52. The article of manufacture of claim 51, wherein each provided  
2 programming interface comprises an object oriented programming interface.

1 53. The article of manufacture of claim 52, wherein the provided  
2 programming interfaces are members of an object oriented class, wherein one class is

3 provided for each generated table, and wherein the programming interfaces for one class  
4 are capable of invoking stored procedures to perform database operations on the table for  
5 which the class of programming interfaces are provided

1 54. The article of manufacture of claim 51, further comprising:  
2 providing one programming interface for each generated stored procedure,  
3 wherein each provided programming interface is called to invoke one stored procedure  
4 call to further invoke and execute one stored procedure in the database.

1 55. The article of manufacture of claim 54, wherein a set of programming  
2 interfaces is provided for each table, wherein each set of programming interfaces  
3 includes:  
4 a create programming interface to invoke one stored procedure to create an entry  
5 in the table associated with the set;  
6 a get programming interface to invoke one stored procedure to retrieve data from  
7 the table associated with the set;  
8 an update programming interface to invoke one stored procedure to update one  
9 entry in the table associated with the set;  
10 a delete programming interface to invoke one stored procedure to delete one entry  
11 in the table associated with the set; and  
12 a list programming interface to invoke one stored procedure to list a description of  
13 all entries in the table associated with the set.

1 56. The article of manufacture of claim 51, wherein the information  
2 maintained in the at least one database table comprises workflow related information.

1 57. The article of manufacture of claim 51, wherein each column definition  
2 indicates a data type and data length of the column.